CASTOR CREEK WATERSHED TMDL

FOR CHLORIDES AND SALINITY/TOTAL DISSOLVED SOLIDS (TDS)

SUBSEGMENT 081501

TMDL Report

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6, DALLAS, TX

and the
Office of Environmental Assessment
Louisiana Department of Environmental Quality

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify water bodies not meeting state water quality standards and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of a pollutant a water body can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and non-point sources discharging to the water body.

In accordance with Section 106 of the Federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ established a comprehensive program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, develop a long-term database for water quality trend analysis, and monitor the effectiveness of pollution controls. Data obtained through the surface water monitoring program are used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ non-point source program.

Castor Creek (Subsegment # 081501), located in the Ouachita River Basin, was listed on the October 28, 1999 Court Ordered §303(d) List as not supporting the water quality standard for propagation of fish and wildlife as a result of elevated levels of chlorides and total dissolved solids (TDS). Chloride and TDS are monitored as indicators for the protection of fish and wildlife propagation use designation. This report documents the data and assessment utilized to establish two TMDLs, one for chlorides and one for salinity/TDS, in accordance with the requirements of Section 303(d) of the Clean Water Act and USEPA guidance. Throughout the rest of this document, the term TDS will also be used to signify salinity. Castor Creek flows from its headwaters near Vernon, Louisiana, to Dugdemona River near Rochelle, Louisiana.

Louisiana's water quality standards [Title 33 Environmental Regulatory Code Part IX, 1113, C(2)]for chloride and TDS are applied as follows:

> *"Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Uses Table, increases over background levels of chloride, sulfate, and*

> *TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 250, and 500 mg/L for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies."*

LDEQ monitoring data were assessed for Castor Creek (Subsegment # 081501) to confirm that the propagation of fish and wildlife use are not being met. Over the 5-year period of 1994-1998, 38 percent of the measurements exceeded the chloride criterion of 25 mg/L, and 73 percent exceeded the TDS criterion of 100 mg/L (see Appendix A, station 0079). For the purpose of calculating current loading on Subsegment #081501, the average pollutant concentration was calculated using monitoring data from LDEQ monitoring station 0079. In Castor Creek the average chloride concentration was 40.70 mg/L and the average TDS concentration was 189 mg/L over the collection period (January 9, 1995 through December 14, 1999).

These TMDLs were developed based on mass balance calculations using harmonic mean flow (HM) and the state chloride standard of 25 mg/L and TDS standard of 100 mg/L. The TMDL calculations include a wasteload allocation, a load allocation, and an implicit margin of safety. A 38.6 percent reduction in chloride loading and a 47.1 percent reduction in TDS loading are needed to meet the standard for the propagation of fish and wildlife.

The LDEQ implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a 5-year cycle with two targeted basins sampled each year. Long-term trend monitoring stations at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 5-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per station each year. Sampling stations are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second 5-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) List. The next targeted monitoring slated for the Castor Creek watershed is in 2004. The statewide sampling schedule for the next 5 years is shown below.

2001 - Lake Pontchartrain Basin and Pearl River Basin
2002 - Red and Sabine River Basins
2003 - Mermentau and Vermilion-Teche River Basins

2004 - Calcasieu and Ouachita River Basins
2005 - Barataria and Terrebonne Basins
(Atchafalaya and Mississippi Rivers will be sampled continuously)

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SECTION 1
INTRODUCTION

Castor Creek, Subsegment #081501 of the Ouachita Basin, was listed on the October 28, 1999 Court Ordered §303(d) List as not supporting water quality standards for propagation of fish and wildlife as a result of elevated levels of chlorides and TDS. This report documents the data and assessment utilized to establish TMDLs for chlorides and TDS in accordance with the requirements of §303 of the Clean Water Act and USEPA guidance. The purpose of a TMDL is to determine the pollutant loading a waterbody can assimilate without exceeding the water quality standard for that pollutant. The TMDL also establishes the load reduction necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total load apportioned to point sources. The LA is the fraction of the total load apportioned to non-point sources. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

SECTION 2
STUDY AREA DESCRIPTION

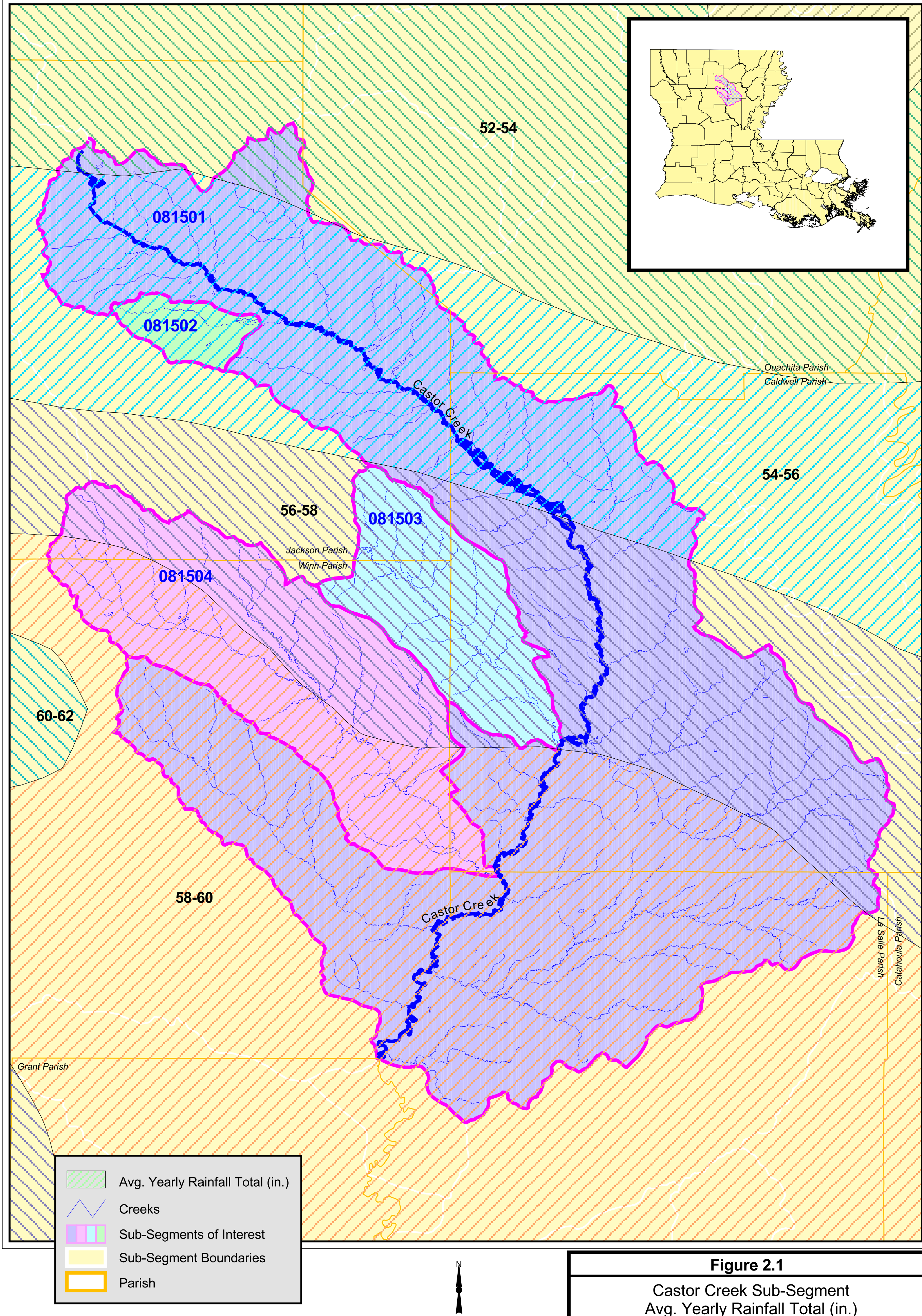
2.1 OUACHITA BASIN

The headwaters of the Ouachita River are found in the Ouachita Mountains in west central Arkansas, near the Oklahoma border. The Ouachita River flows south through northeastern Louisiana and joins the Tensas River to form the Black River, which empties into the Red River. The Ouachita River Basin (Basin 8) covers over 10,000 square miles of drainage area. Most of the basin consists of rich, alluvial plains cultivated in cotton and soybeans. The northwest corner of the basin is a commercially-harvested pine forest (Louisiana Department of Environmental Quality [LDEQ]1996).

2.2 CASTOR CREEK WATERSHED, SUBSEGMENT #081501

The Castor Creek watershed is Subsegment #081501 of the Ouachita River Basin. The headwaters of Castor Creek originate in north Jackson Parish, Louisiana, west of Highway 146 (See Figure 2.1). Subsegment #081501 is comprised of the Castor Creek main stem from its headwaters to its confluence with the Dugdemona River (See Figure 2.2), the Little River, and more than 36 tributaries. Two major tributaries, Flat Creek (Subsegment #081504), and Beaucoup Creek (Subsegment #081503), are included in this assessment.

Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station, is 54 inches based on a 30-year record (Louisiana State University 2000) (See Figure 2.3). The Castor Creek watershed is typical of the northwest corner of the Ouachita Basin. Land uses in the Castor Creek watershed are shown in Tables 2.1 and 2.2 (LDEQ 2000). These land use figures are derived from 1999 USGS GAP database. The watershed is predominantly forest (58 percent) and rangeland (21 percent). The watershed is dotted with a few small towns, most of which are located in the lower portion of the watershed. Less than 1 percent of the land use is urban, and the watershed has experienced little population growth in the past 10 years. The primary towns are shown in Table 2.3. Scattered throughout the entire Castor Creek watershed (including Flat and Beaucoup Creek watersheds) are 5,478 active or abandoned oil and gas wells.



Source: Louisiana Average Yearly Precipitation, 1961-1990
Water and Climate Center of the Natural Resources Conservation Service

Figure 2.1

Castor Creek Sub-Segment
Avg. Yearly Rainfall Total (in.)

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Figure 2.2 Castor Creek Below Chatham, LA

Figure 2.3 Castor Creek at the Confluence with the Dugdemona River

Table 2.1
Land Use Summary for Each Subsegment

	081501 acre	081502 acre	081503 acre	081504 acre	081501 Percent	081502 Percent	081503 Percent	081504 Percent
Wetlands	58,639.5	1,297.2	5,763.8	12,694.9	14.3	15.1	14.3	14.0
Forest Land	235,103.7	4,817.9	2,3213.3	54,709.3	57.4	56.3	57.8	60.6
Rangeland	86,520.5	1,582.1	9,638.5	18,909.4	21.1	18.5	24.0	20.9
Agricultural Land	17,314.0	645.8	359.1	1,830.3	4.2	7.5	0.9	2.0
Urban or built-up land	2,341.1	0.0	0.0	0.0	.0.5	0.0	0.0	0.0
Water	9,307.1	204.6	1,138.2	2,059.1	2.2	2.3	2.8	2.2
Total	409,226.2	8,543.7	40,112.9	90,203.2	100.0	100.0	100.0	100.0

Table 2.2
Aggregate Land Use Summary for Entire Castor Creek Watershed

Total Acres	Percent Total
78,395.4	14.3
317,844.3	57.9
116,650.7	21.2
20,149.3	3.6
2,341.1	.0.4
12,709.1	2.3
548,090.1	100.0

Table 2.3
Towns in Castor Creek Watershed

Name	Estimated Population
Chatham	617
Clarks	650
Grayson	529
Kelly	200
Olla	1410
Sikes	120
Urania	782
Vernon	35

SECTION 3
PROBLEM DEFINITION AND ENDPOINT IDENTIFICATION

3.1 PROBLEM DEFINITION

The purpose of this TMDL report is to meet requirements of Clean Water Act Section 303(d), which requires LDEQ or USEPA to develop a pollutant load allocation for each pollutant identified on the state's USEPA approved 303(d) List. LDEQ's 1999 303(d) List identified chloride and TDS in Castor Creek as the pollutants of concern for which TMDLs are required.

Chloride and TDS data collected between January 1991 and 1997 were the basis for inclusion on the 1999 §303(d) List. For purposes of these TMDLs, ambient data collected between 1997 and 1999 were also included in this assessment. This ambient water quality data were collected from two LDEQ Water Quality Monitoring Network (WQMN) sample stations within the Castor Creek Watershed: one upstream, near Columbia (0332), and one near Tullos (0079) (See Figure 3.1, Castor Creek Watershed). Chlorides and TDS data were collected bimonthly from January 1991 through May 1998 at station 0332, and monthly from January 1991 through December 1999 at station 0079. Additional chlorides and TDS data for station 0079 from March 1978 through December 1990 were also used for this assessment. These water quality data are presented in Appendix A.

There are two WQMN stations within the Beaucoup Creek Watershed: one west of Clarks (0805), and one west of Columbia (0334). Chlorides and TDS data were collected monthly in 1999 at station 0805, and bimonthly from January 1991 through May 1998 at station 0334. These data are presented in Appendix A.

There is one WQMN sample station within the Flat Creek Watershed southeast of Sikes (0806). Chlorides and TDS data were collected monthly in 1999 at this station. These data are presented in Appendix A.

Since flow data from station 0079 (USGS 07370800) were not available, the harmonic mean flow at station 0079 was estimated using the drainage area ratio of that of a nearby gauge station; USGS 07372200 Little River near Rochelle, LA. The resulting harmonic mean flow at station 0079 is 59.51 cfs. The methodology used to calculate this HM flow and a Website for the USGS data used to calculate the flow are are located in Appendix B.

Over the 5-year period of 1995-1999 at WQMN station 0079, 38 percent of the measurements exceeded the chloride criterion of 25 mg/L, and 73 percent exceeded the TDS criterion of 100 mg/L (See Figures 3.2 and 3.3). At WQMN station 0079, the average chloride concentration was 40.70 mg/L, and the average TDS concentration was

107 mg/L over the sampling period of January 9, 1995 through December 12, 1999 (See Figures 3.4 and 3.5).

3.2 ENDPOINT IDENTIFICATION

Water quality standards for the State of Louisiana have been defined in Louisiana Environmental Regulatory Code (ERC) Title 33 Part IX (LDEQ 2000) according to designated uses of the waterbodies. Designated uses for Castor Creek from its headwaters to the Calcasieu River include primary contact recreation, secondary contact recreation, and propagation of fish and wildlife. Both general narrative standards and numerical criteria are defined in the State Water Quality Standards. General standards include prevention of objectionable color, taste and odor, solids, toxics, oil and grease, foam, and nutrient conditions, as well as aesthetic degradation. The numerical criteria for chlorides, sulfate, and TDS for Castor Creek are shown in Table 2.4.

Table 3.1 Current Numeric Criteria for Castor Creek, Subsegment 081501 (LDEQ 2000)

Parameter	Criteria
Cl, mg/L	25
SO_4, mg/L	25
TDS, mg/L	100

The numeric criteria for chlorides and TDS in Beaucoup Creek (subsegment #081503) and Flat Creek (subsegment #081504) are also 25 mg/L and 100 mg/L, respectively. As defined in the State Water Quality Standards, criteria for chlorides and TDS are to be met below the point of discharge after complete mixing. Because criteria are developed over a long-term period, the harmonic mean flow will be applied for mixing (ERC Title 33 Part IX, §1115, C.8).

Figure 3.1
Castor Creek Sub-Segment Dischargers and Stations

Figure 3.2
Castor Creek Near Tullos, Louisiana (0079) Chlorides, 1995-1999

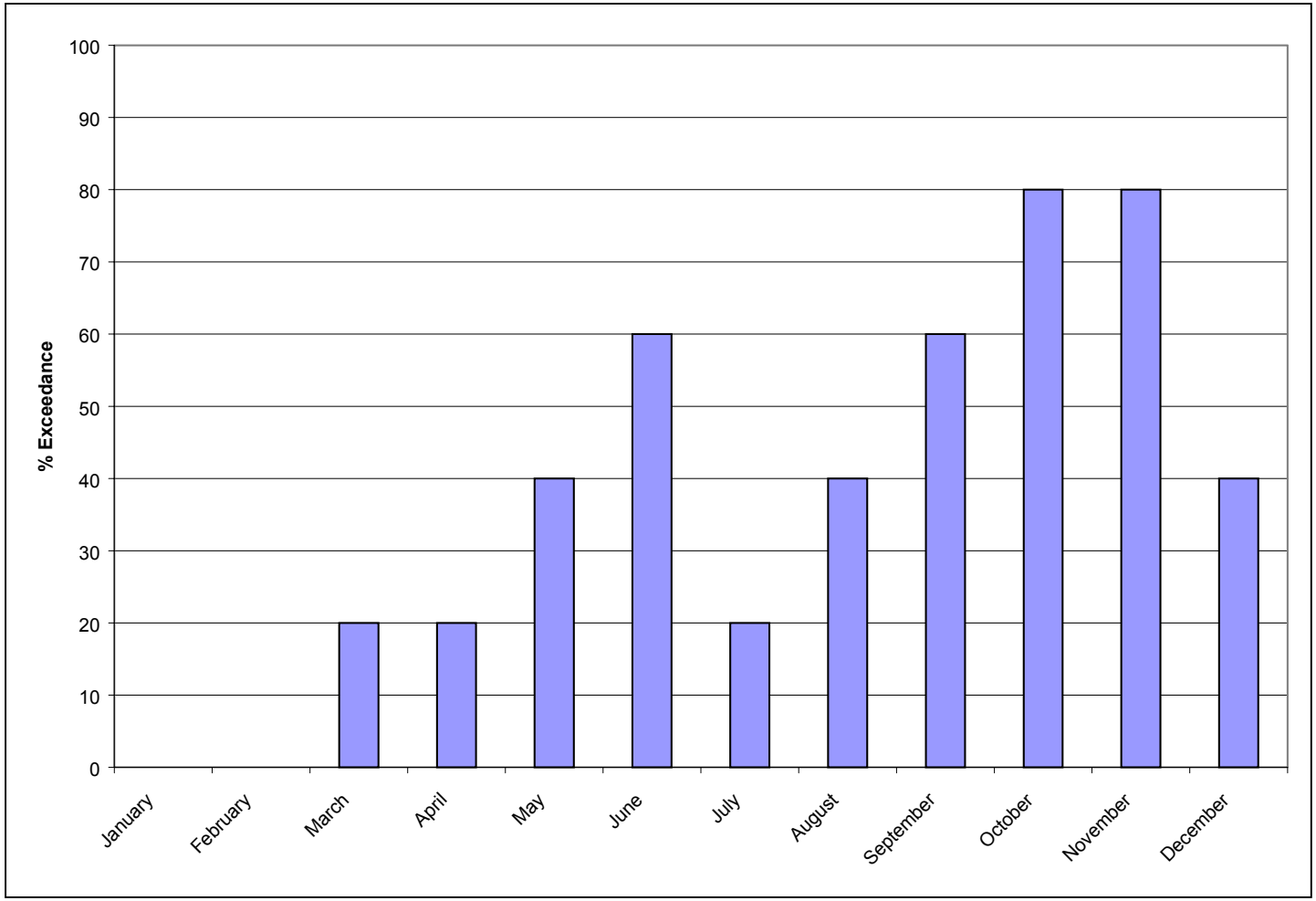


Figure 3.3
Castor Creek Near Tullos, Louisiana (0079) TDS, 1995-1999

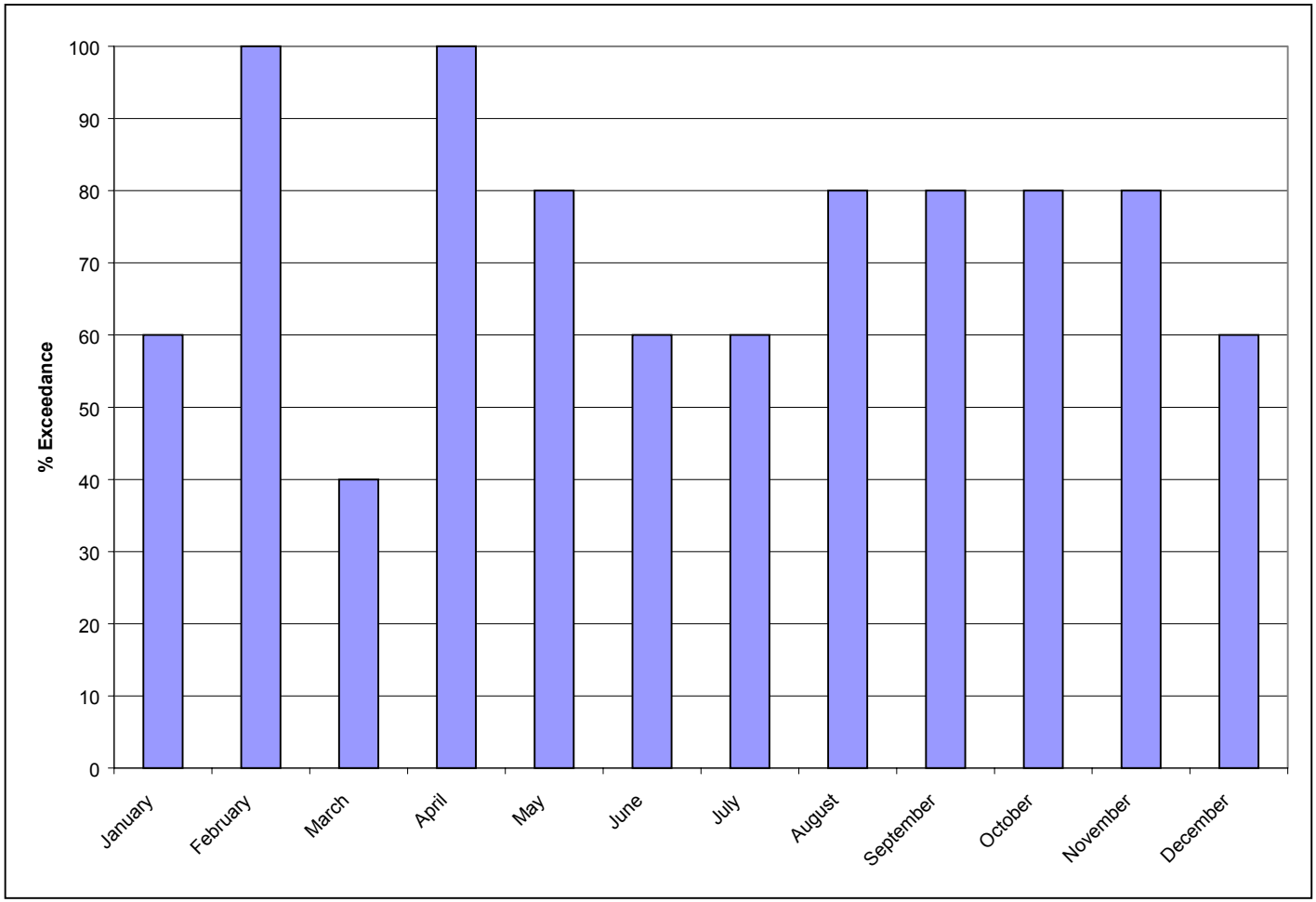


Figure 3.4
Castor Creek Near Tullos, Louisiana (0079) Chlorides, 1995-1999

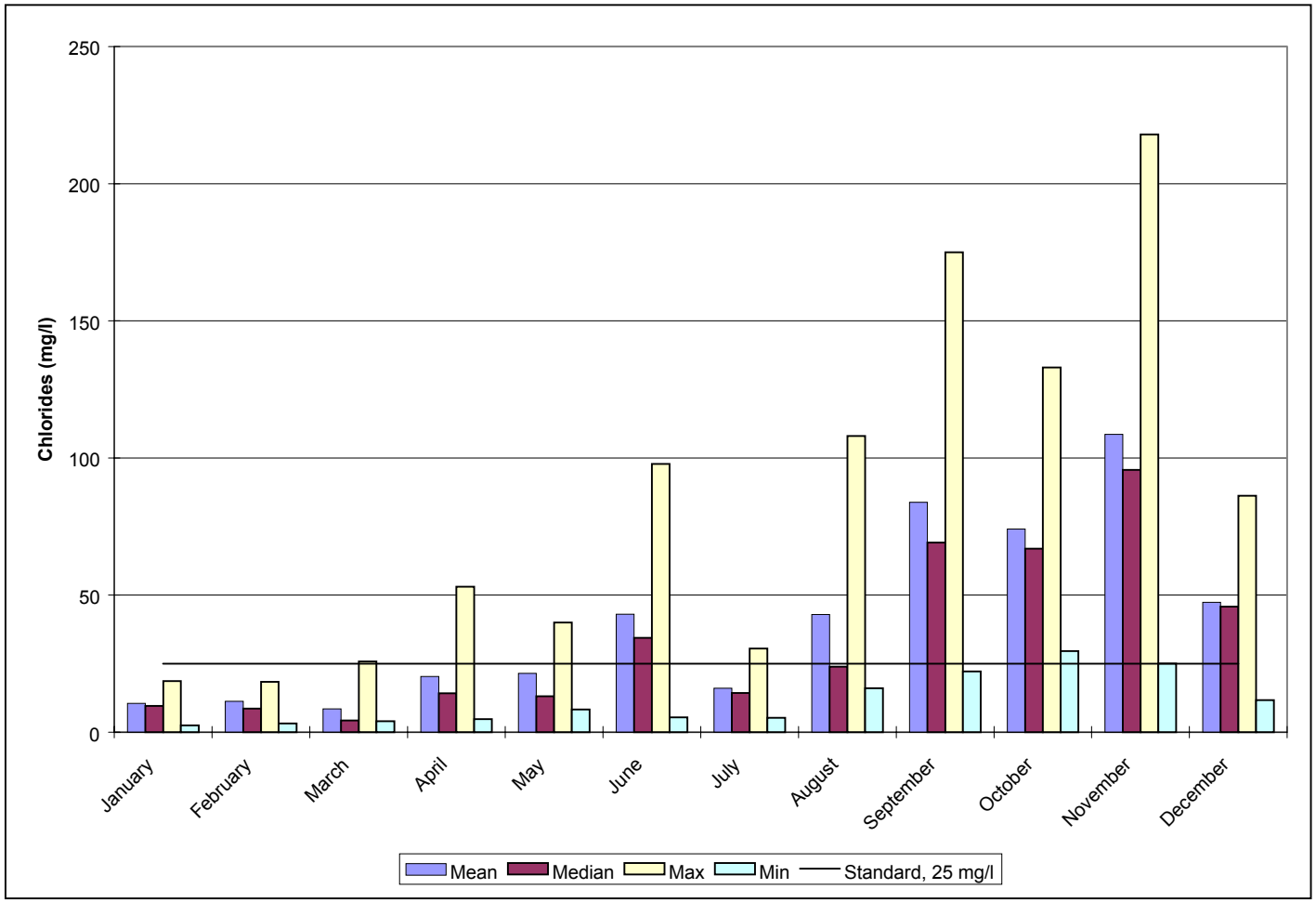
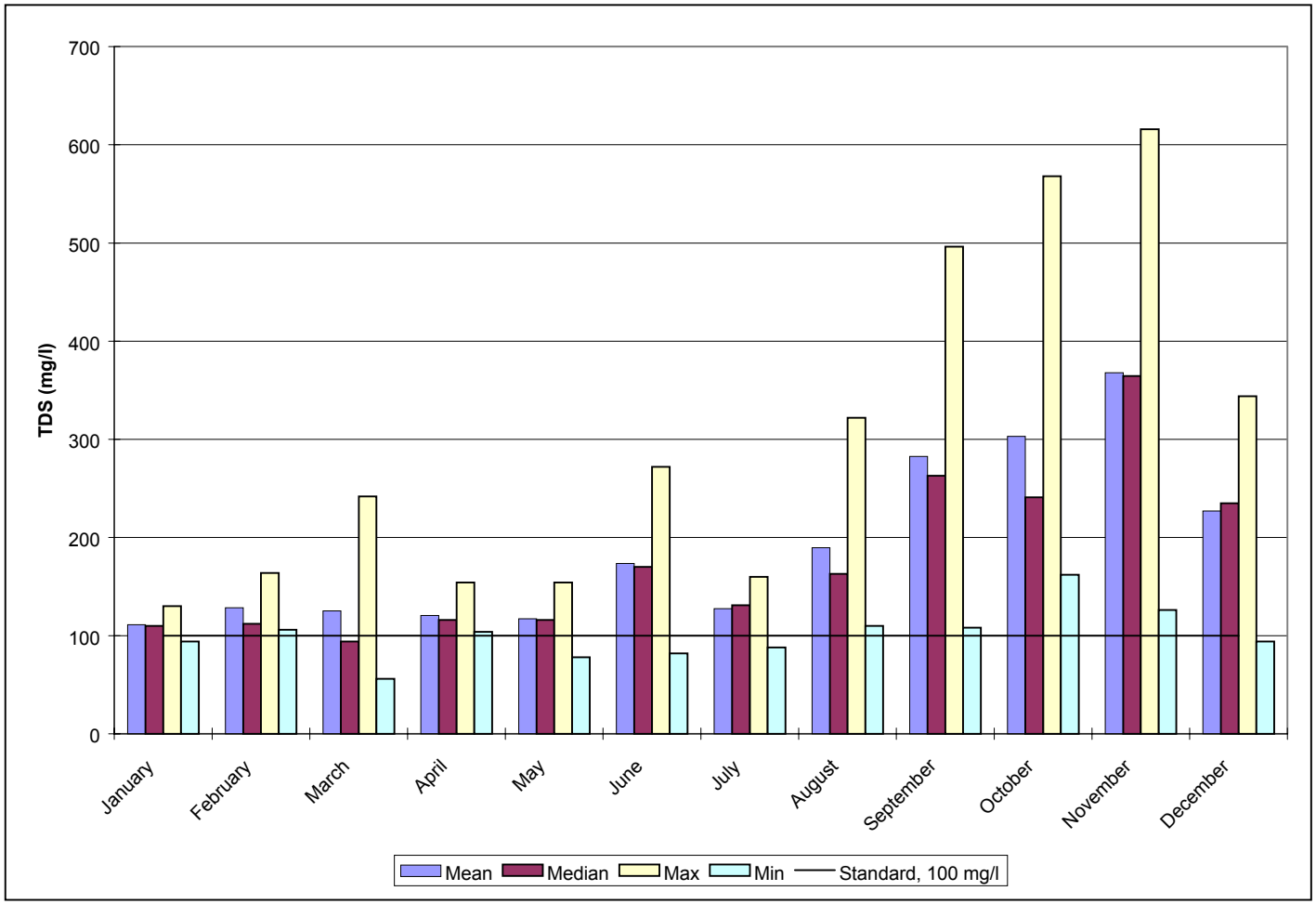


Figure 3.5
Castor Creek Near Tullos, Louisiana (0079) TDS, 1995-1999



SECTION 4
IDENTIFICATION OF POLLUTION SOURCES

The sources, identified in the 1998 Louisiana Water Quality Inventory as affecting the water quality of Castor Creek, are unknown (LDEQ 1998). Further investigation of existing data and information revealed the following point and non-point sources of chlorides and TDS.

4.1 POINT SOURCES - DISCHARGER INVENTORY

All point source dischargers located in this watershed are small municipal or industrial wastewater facilities that discharge into tributaries of Castor Creek (See Figure 3.1 Castor Creek Watershed). Currently none of these facilities have permit limits for chlorides or TDS.

Table 4.1
Municipal Wastewater Treatment Facilities in Castor Creek Watershed (Subsegments 081501, 081504)

Name	File Number	Waterbody	Permitted Flow (gpd)	Permitted Flow (cfs)	% of Flow @ 0079 (59.51 cfs)
Louisiana Pacific	LA0007668	Unnamed Creek to Chickasaw Creek	40,000	0.062	0.10
Town of Olla	LA0032379	Bear Branch to Chickasaw Creek	48,000	0.074	0.12
Town of Urania	LA0040991	Chickasaw Creek	28,000	0.043	0.07
Hunt Plywood	LA0098884	Unnamed Creek to Chickasaw Creek	500	0.001	0.00
Town of Chatham	LA0049905	Unnamed Ditch to Edwards Creek	80,000	0.124	0.21
Kelly Elementary	LAG530949	Local drainage to Black Bayou	3,125	0.005	0.01
Columbia Heights Sewer District	LA0060712	Hurricane Creek to Black Bayou	25,500	0.039	0.07
Village of Sikes	LAG540647	Tributary of Flat Creek	20,000	0.031	0.05
TOTAL			245,125	0.379	0.64

As shown in Table 4.1, point source dischargers contribute, on average, less than one percent of the harmonic mean flow at station 0079. With such a miniscule portion of the overall flow being contributed by point sources it can be surmised that the wastewater dischargers in the watershed have no real impact on the overall loading of chlorides and TDS to Castor Creek. This is further demonstrated by the following calculations, which are provided to show that point source discharges have almost no affect on instream concentrations of chlorides and TDS. Since point sources do not represent a significant source of chloride or TDS, these TMDLs only address the non-point source contribution of chloride and TDS.

Equation 1 is a mass balance to estimate the chloride and TDS concentrations due to non-point source between stations 0332 and 0079. Station 0332 is upstream of all wastewater discharges and has mean chloride and TDS concentrations of 6.9 mg/L and 107 mg/L, respectively. Assuming that each of the municipal discharges shown in Table 4.1 has a chloride and TDS content of 100 mg/L and 850 mg/L, respectively, which are high for municipal discharges (Metcalf and Eddy 1991), and using upstream and downstream harmonic mean flows of 0.26 and 59.51 cfs, respectively, the resultant concentrations of non-point source chloride and TDS between stations 0332 and 0079 would be 40.46 mg/L and 185.1 mg/L, respectively. Harmonic mean flow at station 0332 (USGS 07370500) was estimated by multiplying the HM calculated without zero flow days by the ratio of the number of non-zero flow values to the total number of flow values (see Appendix B). Since the LDEQ criterion for chloride and TDS are 25 mg/L and 100 mg/L, respectively, and the mean chloride and TDS concentrations at station 0079 are 40.7 mg/L and 189 mg/L, respectively, reducing point source concentrations of chloride and TDS will not help meet the water quality standards at station 0079.

Equation 1

$$[C1]_{non\text{-}point} = \frac{(Q_{downstream} * [C1]_{downstream}) - (Q_{upstream} * [C1]_{upstream}) - (Q_{discharge} * [C1]_{discharge})}{Q_{nonpoint}}$$

$$[Cl]_{non\text{-}point} = \frac{(59.51 * 40.7) - (0.26 * 6.9) - (0.379 * 100)}{58.87}$$

$$[Cl]_{non\text{-}point} = 40.46 \text{ mg/L}$$

$$[TDS]_{non\text{-}point} = \frac{(59.51 * 189) - (0.26 * 107) - (0.379 * 850)}{58.87}$$

$$[TDS]_{non\text{-}point} = 185.1 \text{ mg/L}$$

4.2 NONPOINT SOURCES

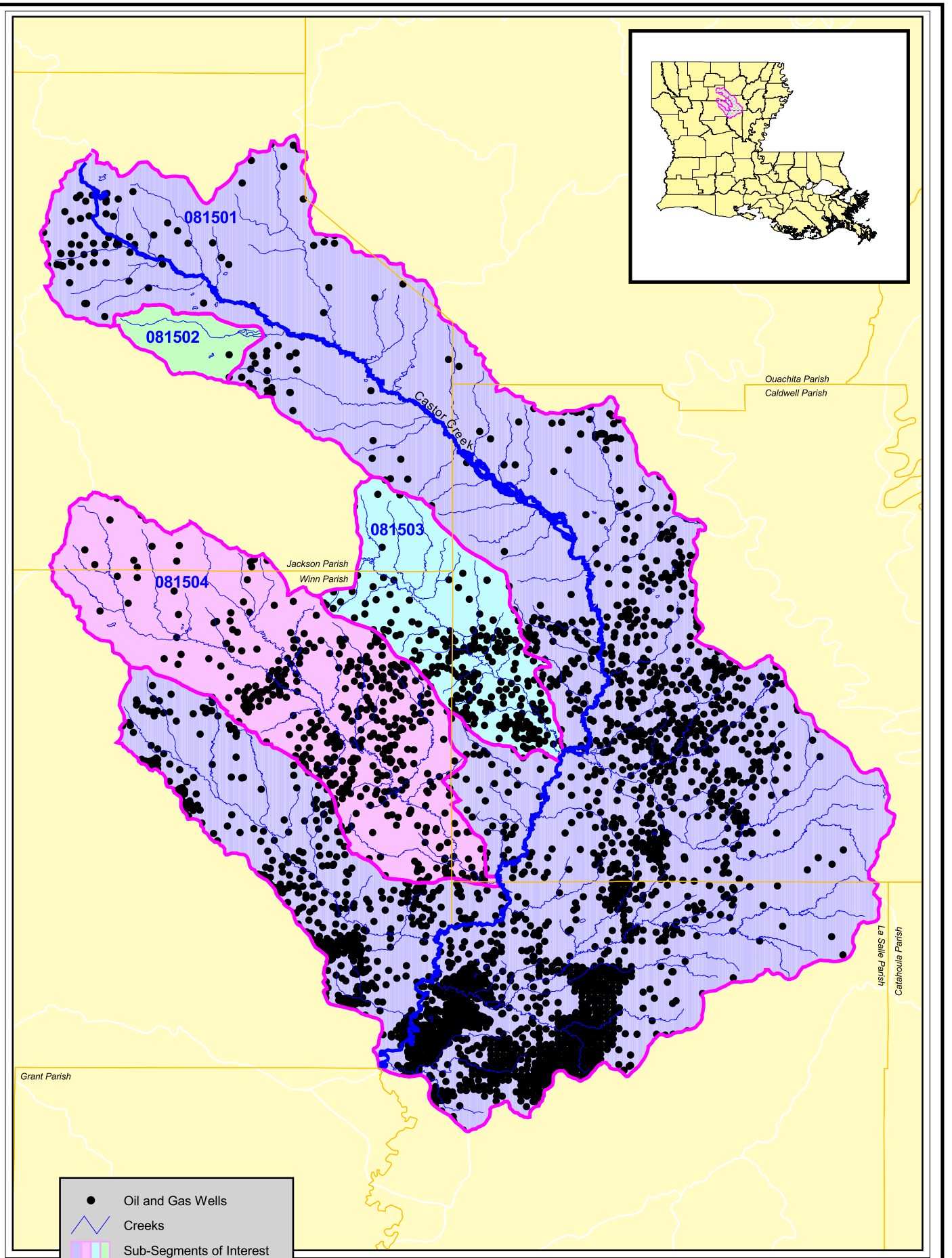
Chlorides and TDS pollutant loadings in Castor Creek are dominated by non-point sources including natural background sources and man-induced activities related to oil and gas wells throughout the watershed. From the preceding calculations, non-point sources are estimated to contribute 99.4 and 97.9 percent of the chloride and TDS concentration at station 0079, respectively. Figure 4.1 and Table 4.2 depict the thousands of active and abandoned oil and gas wells scattered throughout the watershed. The vast majority of the wells are downstream of WQMN station 0332, which further denotes the dominant impact non-point source pollution loadings have on the mainstream of Castor Creek. These large numbers of wells create a significant conveyance mechanism for chlorides and TDS through groundwater filtration and rainfall runoff into Castor Creek and its tributaries.

Little information is available which can be used to quantify a cause and effect relationship between observed saline flows and the identified sources in Castor Creek and its tributaries. After decades of oil and gas production throughout the watershed, it can be concluded that chloride and TDS pollutant loadings to Castor Creek are the direct result of improperly plugged wells, abandoned brine pits, rainfall runoff transporting pollutants to surface waters, or an indirect result of groundwater migration through abandoned or improperly cased oil wells. Historical practices of brine discharges from active wells has elevated concentrations of chlorides and TDS at the surface layer. Groundwater throughout the watershed is naturally high in TDS, which magnifies the problem caused by the vast number of wells. High TDS values were observed from well data within the watershed from the Sparta Aquifer. Well number CA-105 in particular, located in the northwest corner of Caldwell Parish, showed TDS values that averaged 572 ppm for the years 1994-1995 (LDEQ, 1996a).

Table 4.2
Distribution of Oil and Gas Wells Throughout
Castor Creek Watershed

Sub-Segment ID	Estimated Number of Oil and Gas Wells
081501	4796
081503	241
080504	441
Total	5478

Analyzing the water quality data over a 5-year period (1994-1998) suggests a seasonal relationship with chloride concentrations in Castor Creek at WQMN station 0079 (see Figure 4.2). A similar compilation of the TDS for WQNM station 0079 indicates that TDS concentrations are consistently above the water quality standard throughout the year (see Figure 4.3). Both Figures 4.2 and 4.3 reinforce the fact that non-point source loading caused by rainfall runoff is a significant contributor of chloride and TDS to Castor Creek and its tributaries. Non-point source pollution is the primary source of chloride and TDS loading to Castor Creek and its tributaries. However, data is not available to adequately quantify or differentiate natural from man-induced non-point source loading of chlorides and TDS.



Source: Louisiana Department of Natural Resources, Office of Conservation

Figure 4.1

Castor Creek Sub-Segment
Oil and Gas Wells

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Figure 4.2
Castor Creek Stations 0332 and 0079 Chlorides, 1994-1998

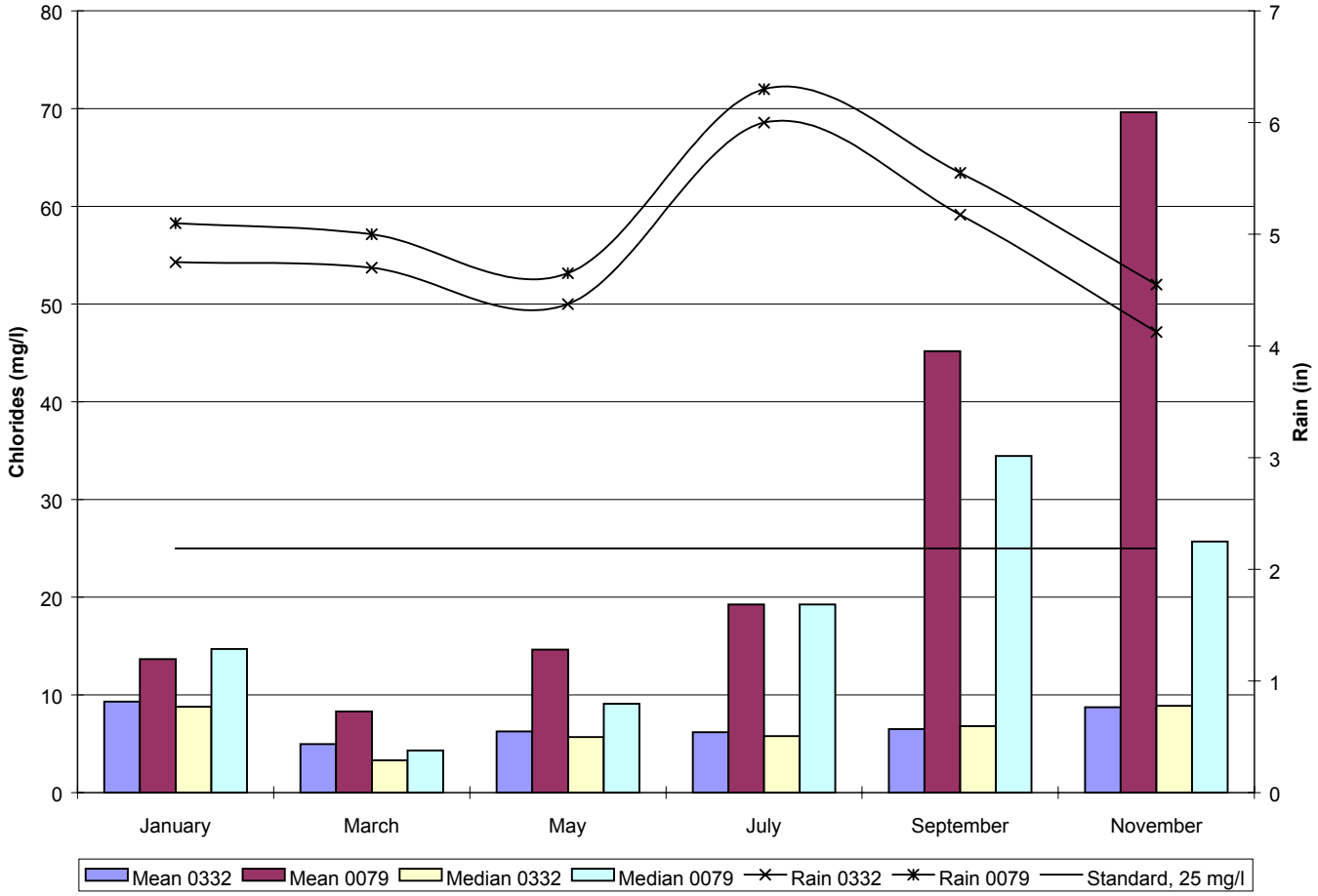
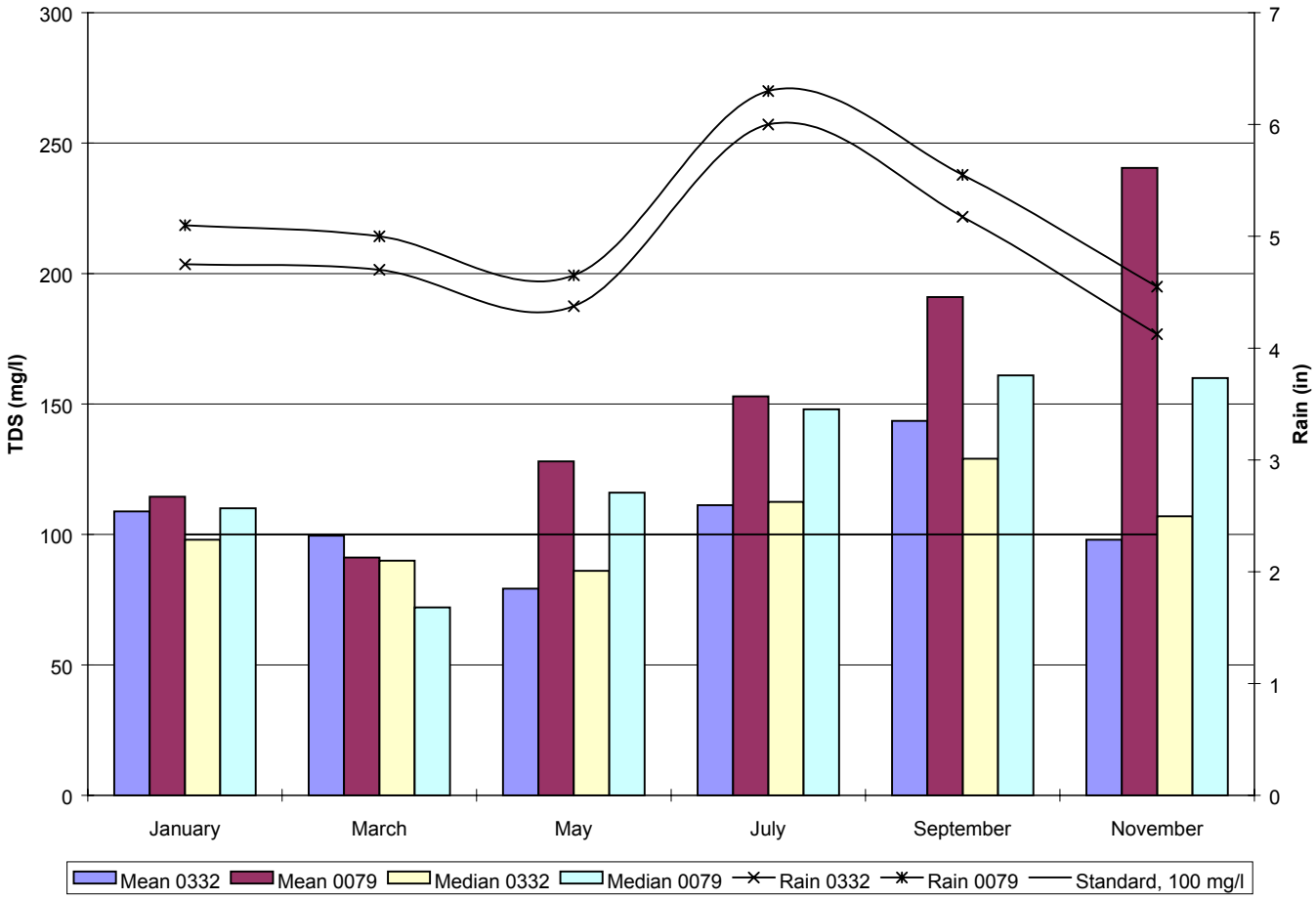


Figure 4.3
Castor Creek Stations 0332 and 0079 TDS, 1994-1998



SECTION 5
TMDL CALCULATIONS

5.1 CURRENT LOAD EVALUATION

Chloride and TDS loadings were calculated using the instream Chloride concentrations, TDS concentrations, and the harmonic mean flow of the stream. Harmonic mean flow was used in all calculations as defined by the state water quality Standards (ERC Title 33, Part IX §1115, C8). The following equation can be used to calculate chloride and TDS loads:

Equation 2. **C * Q in cfs * 5.39** or **C * Q in MGD x 8.34**

Where: C = concentration in mg/L

Q = harmonic mean stream flow in cfs or MGD

A traditional expression of the loading can be developed by setting one critical or representative flow and concentration, and calculating the chloride and TDS loads using Equation 2. The difficulty with this approach is determining the appropriate flow or concentration value to use.

For the purpose of calculating current loadings on Subsegment #081501, the average chloride and TDS concentrations were calculated using LDEQ monitoring data from WQMN station 0079. Based on a period from 1995 to 1999 at monitoring station 0079, the average chloride and TDS concentrations were 40.7 mg/L and 189 mg/L, respectively. In addition, the harmonic mean flow for Castor Creek at station 0079 was estimated at 59.51 cfs (See Appendix B). Using these values and Equation 2, it is estimated that the current loadings are:

- Chloride current load = 40.7 mg/L * 59.51 cfs * 5.39 = 13,055 lb/day.
- TDS current load = 189 mg/L * 59.51 cfs * 5.39 = 60,623 lb/day.

5.2 TMDL

The TMDLs for Castor Creek are determined by using the following calculations for chlorides and TDS. Based on this calculation, a waste load allocation, load allocation, and load reduction have been determined and described in following sections.

Chloride:

$$TMDL = C_{std} * Q\ cfs * 5.39$$

Where: Cstd=25 mg/L, Q= 59.51 cfs

$$TMDL = 25\ mg/L * 59.51\ cfs * 5.39 = 8{,}019\ lb/day.$$

TDS:

$$TMDL = Cstd * Q\ cfs * 5.39,$$

Where Cstd=100 mg/L, Q= 59.51 cfs

$$TMDL = 100\ mg/L * 59.51\ cfs * 5.39 = 32{,}076\ lb/day.$$

5.3 WASTELOAD ALLOCATION (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain in-stream chloride and TDS concentrations of 25 mg/L and 100 mg/L, respectively, at the downstream edge of the mixing zone. Point source discharges located in this watershed have a total permitted design flow of 0.379 cfs (see Table 4.1). As discussed in Section 4, it is shown that wastewater dischargers in the watershed have almost no affect on instream concentrations of chlorides and TDS. For these TMDLs, an aggregate WLA was first established for all eight dischargers using default values for their effluent concentrations of chlorides and TDS. The WLA is calculated based on the full permitted capacity of each discharger in the watershed. The combination of these two factors also provides an allowance for future growth. The WLA for chlorides was calculated using a high discharge concentration of 100 mg/L (Metcalf and Eddy 1991). The WLA for TDS was calculated using a high discharge TDS concentration of 850 mg/L (Metcalf and Eddy 1991). The resulting calculation of the WLA for all point sources is:

Chlorides:

$$WLA = High\ [Cl]_{discharge} * Qe * 5.39,$$

$$WLA = 100 * 0.379 * 5.39 = 204\ lb/day$$

TDS:

$$WLA = High\ [TDS]_{discharge} * Qe * 5.39,$$

$$WLA = 850 * 0.379 * 5.39 = 1{,}736\ lb/day$$

Using these aggregate pollutant loading calculations for all eight point source dischargers, individual waste load allocations were back calculated for each permitted discharge using a flow weighted average approach. The individual WLAs for point source dischargers are summarized in Table 5-1 below. Given the insignificant contribution of pollutant loading from the point source dischargers in the watershed, these TMDLs are structured to obtain the pollutant reductions from non-point sources throughout the watershed.

Table 5.1
Individual WLA for Municipal Wastewater Treatment Facilities in Castor Creek Watershed
(Subsegments 081501, 081504)

Name	File Number	Individual WLA (lb/day)	
		Chloride	TDS
Louisiana Pacific	LA0007668	33	284
Town of Olla	LA0032379	40	340
Town of Urania	LA0040991	23	198
Hunt Plywood	LA0098884	0	4
Town of Chatham	LA0049905	67	567
Kelly Elementary	LAG530949	3	22
Columbia Heights Sewer District	LA0060712	21	181
Village of Sikes	LAG540647	17	142
Total		204	1,736

5.4 LOAD ALLOCATION (LA)

The load allocation for non-point sources at a given flow can be calculated using Equation 2 and the following relationship:

TMDL (@ given flow and criterion) – (WLA) = LA

Chlorides:

8,019 lb/day (TMDL @ 59.51 cfs) – 204 lb/day (WLA) = 7,815 lb/day

LA (for instream flow of 59.51 cfs) = 7,815 lb/day

TDS:

32,076 lb/day (TMDL @ 59.51 cfs) – 1,736 lb/day (WLA) = 30,340 lb/day

LA (for instream flow of 59.51 cfs) = 30,340 lb/day

5.5 SEASONAL VARIABILITY

Louisiana's water quality standards for chlorides and TDS are for January through December. Therefore, no seasonal variability was accounted for in the TMDL calculations.

5.6 MARGIN OF SAFETY

Federal regulations [40 CFR § 130.7(c)(1)] require that TMDLs take into consideration a margin of safety. USEPA guidance allows for use of implicit or explicit expressions of the MOS, or both. For the Castor Creek TMDLs, an analysis of LDEQ ambient data was employed to determine critical seasonal conditions and an appropriate margin of safety was used. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin is implicit. When a percentage of the load is factored into the TMDL calculations, the margin of safety is explicit. In this TMDL for chloride and TDS, conservative assumptions have been used and therefore, the MOS is implicit. These conservative assumptions are:

- Using harmonic mean flows to calculate current loading to obtain load reduction.
- Treating chloride and TDS as conservative pollutants, that is, pollutants that do not degrade in the environment.

- Using the chloride and TDS water quality standard of 25 mg/L and 100 mg/L, respectively, as established by Louisiana water quality standards, rather than using site-specific criteria and seasonable variability factors.
- Using the design flow (where available) of the point source discharges rather than actual flow rates, which are typically much lower.
- Non-point source contributions are diminishing over time because of existing state programs such as the ones discussed in the section below.

5.7 ONGOING AND FUTURE POLLUTANT LOADING REDUCTIONS

The load reduction needed to meet the water quality standard for propagation of fish and wildlife in subsegment #081501 at 59.51 cfs is 5,036 and 28,547 lb/day for chlorides and TDS, respectively (38.6 and 47.1 percent reduction, respectively). This was obtained by calculating the allowable TMDL and subtracting this load from the observed load at each station in the following manner:

Chloride:

Current Load – TMDL = Load Reduction
13,055 lb/day – 8,019 lb/day = 5,036 lb/day

TDS:

Current Load – TMDL = Load Reduction
60,623 lb/day – 32,076 lb/day = 28,547 lb/day

The results of the calculations used to determine the current load, the WLA, and LA and the load reduction are summarized below in Table 5.2.

Table 5.2
Estimated Reduction in Loading Necessary (lb/day) and Associated Concentration (mg/L)

	Chlorides		TDS	
	lb/day	mg/L	lb/day	mg/L
Current Load	13,055	40.7	60,623	189
TMDL	8,019	25	32,076	100
Wasteload Allocation (for all dischargers)	204	100	1,736	850
Load Allocation (for all non-point sources)	7,815		30,340	-
Load Reduction	5,036	-	28,547	-
Percent Reduction	38.6	-	47.1	-

Incremental improvement to achieve water quality standards for chlorides and TDS in Castor Creek is expected through the ongoing management of orphaned and active wells. State programs and regulations designated to address pollutant loadings from oil and gas wells include the Orphan Well Program and the Inspection and Enforcement Program, and the prohibition of discharge of brine into freshwater. Other appropriate best management practices to reduce chloride and TDS loadings in the watershed may be identified in the future.

5.7.1 Orphan Well Program

The Oilfield Site Restoration Commission was created by Act 404 of 1993 and, with fees collected and deposited in the Oilfield Site Restoration Fund, provides for proper and timely cleanup, closure, and restoration of abandoned oilfield sites. Further, the Commission supervises creation of voluntary site specific accounts to provide for future site restoration, thus facilitating the transfer of well ownership. There are 3,461 documented orphaned wells and 1,327 orphaned open pits in the State. Approximately 78 percent of the orphaned wells are in north Louisiana. Since inception of this program, $25.22 million has been spent plugging 1,007 orphan wells and closing 395 pits. Also included in this cost are site assessment, site restoration, and equipment removal. Revenue for the fund is generated from a fee on production, prorated by producing category.

When there is a transfer of ownership interest of an oilfield site, either party can file an application to establish a site specific trust account to cover restoration costs. The Secretary will seek to recover site restoration expenses from any party who has operated or held a working interest in an orphaned oilfield site which has been restored with Act 404 funds if the site was transferred after May 1, 1993. If the orphaned oilfield site was transferred prior to May 1, 1993 and is restored with Act 404 funds, the Secretary is authorized to recover restoration costs from parties which formerly operated or held a working interest in the orphaned oilfield site if restoration costs exceed $200,000. This program will play in important part in diminishing chloride and TDS loadings in the Castor Creek Watershed.

5.7.2 Inspection and Enforcement

The Inspection & Enforcement Section of the Department of Natural Resources is also responsible for the review of Lease Facility Inspection Reports, Production Pit Reports, Reserve Pit Inspection Reports, and Narrative Reports submitted by the 30 Conservation Enforcement Agents as a result of their inspections of oil & gas wells and associated facilities. Any violations of Statewide Order No. 29B (spills, leaks, general house-keeping) noted therein are addressed through the issuance of Compliance Orders to the operator of the well/facilities.

In 2001, in response to a citizen's complaint, the Inspection and Enforcement Section conducted a field wide inspection of all wells and associated facilities

(equipment, tanks, containment areas, pits) located in the Tullos Urania Field, LaSalle Parish, Louisiana. As a result, numerous compliance orders have been issued to the operators of wells where violations were noted. To date, the majority of the compliance orders have been resolved with an exception of the orders that were issued to operators that have since been orphaned. Future inspections will be slated for other counties within the Castor Creek watershed.

Other existing state regulations that are in place to restrict chloride and TDS loadings in Castor Creek watershed can be found in Title 33, ERC Part IX, §§1701 and 1901 and Title 33, ERC Part IX, §708.C.2 of the Louisiana Water Regulations, which prohibit the discharge of brine water into freshwater.

5.8 FUTURE WATER QUALITY MONITORING

In accordance with Section 106 of the Federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a comprehensive program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring quality of the data collected. Objectives of the surface water monitoring program are to determine quality of the state's surface waters, to develop a long-term database for water quality trend analysis, and monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ non-point source program.

The LDEQ implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a 5-year cycle with two targeted basins sampled each year. Long-term trend monitoring stations at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 5-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per station each year. Sampling stations are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second 5-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the next 5 years is shown below.

2001 - Lake Pontchartrain Basin and Pearl River Basin
2002 - Red and Sabine River Basins
2003 - Mermentau and Vermilion-Teche River Basins
2004 - Calcasieu and Ouachita River Basins
2005 - Barataria and Terrebonne Basins
(Atchafalaya and Mississippi Rivers will be sampled continuously)

SECTION 6
PUBLIC PARTICIPATION

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comments concerning the TMDL. EPA prepared this TMDL pursuant to the consent decree, Sierra Club, et al. v. Clifford et al., No. 96-0527, (E.D. La.) signed and entered on April 1, 2002. Federal regulation requires that public notice be provided through the Federal Register and through newspapers in the local area. The Federal Register notice was issued on March 29, 2002 (Volume 67, Number 61, pages 15196 – 15198). This TMDL was also noticed in local newspapers including the Lake Charles American Press and New Orleans Times-Picayune. Comments and additional information were submitted during the 30-day public comment period and this TMDL has been revised accordingly. Comments and responses are made available in Appendix C. EPA will provide notice that this TMDL has been made final, to the court, and to the Louisiana Department of Environmental Quality (LDEQ) along with a request that it be incorporated into LDEQ's current water quality management plan.

SECTION 7
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APPENDIX A
WATER QUALITY DATA

APPENDIX A
WATER QUALITY DATA

Castor Creek West of Colombia, LA
Water Quality Monitoring Network Site 0332
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
5/11/98	1135	1	19.2	22.1	18	50	5.7	5	11	42.1	.
3/9/98	955	1	16.8	18.2	60	40	2	3.6	18	90	.
1/12/98	1120	1	5.5	8.7	21	60	1.9	5.4	13	146	.
11/17/97	1100	1	8.1	20.5	6.3	40	9.3	18	K 4.0	156	.
9/8/97	1050	1	42	38.5	9.7	50	5.3	2.5	5	224	.
7/14/97	1050	1	22.3	20.9	17	60	5.4	5.4	20	67.9	.
5/12/97	1105	1	13.2	14.4	10	50	5.9	5.3	8	86.1	.
3/10/97	1105	1	10.7	14.4	15	80	3.3	5.9	9	146	.
1/6/97	1000	1	30.2	33.2	20	60	16.1	9.5	9.3	132	.
11/18/96	1145	1	26.4	23.1	4.2	80	7.8	4.9	K 4.0	22	.
9/9/96	1150	1	28	24.9	14	80	7.1	3.8	15	148	.
7/8/96	1135	1	33.6	36.7	9.8	100	8.8	5.7	4	152	.
5/13/96	1155	1	42.4	35.7	15	70	11.7	3.5	14	72	.
3/11/96	1125	1	24.5	24.5	7.8	60	13.2	6.9	8	68	.
1/8/96	1145	1	11.1	15.3	8	60	8.8	11.3	5	90	.
11/13/95	1140	1	30.1	29	3.4	60	9.4	7.6	4	116	.
9/11/95	1154	1	43.5	37.7	12	60	6.9	2.9	4	92	.
7/10/95	1140	1	9.2	14.7	15	60	4.3	9.1	20	119	.
5/8/95	1125	1	13.7	12.6	30	50	4	4.2	42	102	.
3/13/95	1115	1	7.3	7.1	28	100	2.6	5.8	14	132	.
1/9/95	1145	1	6.7	13	27	60	8.1	7.3	9	98	.
11/14/94	1120	1	15.4	18.7	10	60	8.5	4.8	6	98	.
9/12/94	1140	1	22.1	24.7	17	50	6.7	5.2	10	110	.
7/11/94	1140	1	27.4	26.6	18	50	6.2	3.6	15	106	.
5/9/94	1115	1	8	12.4	28	40	4	4.4	16	94	.
3/14/94	1135	1	5.9	9.2	17	60	3.8	5.5	8	62	.
1/10/94	1150	1	11.4	17	5.5	60	11.7	9.9	K .4	78	.
11/15/93	1130	1	10.9	18.3	17	70	8.9	14.5	15	92	.
9/13/93	1140	1	41.8	37.5	13	70	7	3.2	2	72	.
7/12/93	1125	1	25.6	29.6	21	50	6.3	4.5	11	130	.
5/10/93	1128	1	13	17	29	60	5.2	5.5	30	90	.
3/8/93	1140	1	9.4	14.8	28	40	7.7	7.2	6	102	.
1/11/93	1130	1	9.3	14.2	21	50	9.4	6.7	7	110	.
11/16/92	1108	1	10	15.6	18	50	8.9	8.4	8	136	.
9/14/92	928	1	17.9	22.5	18	50	6.9	8.1	7	100	.
7/13/92	1103	1	18.6	24.9	27	40	5.2	4.2	13	126	.
5/11/92	1105	1	14.5	19.8	50	20	6	5	22	136	.
3/9/92	1139	1	7.9	9	25	60	2.5	3.4	18	88	.
1/6/92	1124	1	14	15.5	16	20	8.1	5.4	8	122	.
11/18/91	1043	1	10	13.9	20	40	7.1	8	9	130	.
9/9/91	905	1	16.2	20.4	32	60	6	5.3	52	104	.
7/15/91	1135	1	22.8	25.3	40	50	5.1	2.9	28	76	.
5/14/91	1143	1	12.9	14.7	26	50	2.8	3.4	22	124	.
3/11/91	1248	1	11.1	13.7	24	60	4.8	5.6	17	96	.
1/15/91	1211	1	4.9	8.6	18	70	3.5	6.1	K 4.0	50	.

APPENDIX A
WATER QUALITY DATA

Castor Creek Near Tullos, Louisiana
Water Quality Monitoring Network Site 0079
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
12/14/99	1257	1	87.3	50.7	12	55	86.2	34.3	K 4.0	340	.
11/16/99	1435	1	158	44	8.6	65	165	37.5	K 4.0	535	.
10/19/99	1200	1	169	43.4	8.9	70	133	46.7	4	568	.
9/21/99	1035	1	109	43.7	6.7	55	175	23.3	8	496.1	.
8/17/99	1215	1	61.4	42.4	7	60	108	10.8	K 4.0	322	.
7/20/99	1000	1	28.3	27.2	17	90	20.5	7.5	6.7	126	.
6/15/99	1330	1	45.6	30.3	21	60	31.1	7.7	14.5	154	.
5/18/99	1000	1	32.9	26.8	22	5	37	6.8	11.5	154	.
4/20/99	1340	1	13.9	15.7	31	60	4.8	4.7	31.5	154	.
3/16/99	1140	1	7.8	10.5	34	70	4	5.5	19.4	242	.
2/17/99	1140	1	16.3	20.3	18	40	8	7.3	15.5	106	.
1/19/99	1030	1	9.5	14	20	50	7.1	8.9	6	94	.
5/11/98	1048	0	17.8	22.1	23	50	13.1	6.9	18	78	.
4/13/98	1130	0	22	22.1	25	50	13.3	7	19	110	.
3/9/98	1305	0	8	11.6	55	60	4.3	6.7	32	56	.
2/9/98	1020	1	5.1	7.7	22	50	3.2	6.1	9	112	.
1/12/98	1140	0	5	6.9	23	70	2.5	4.3	16	130	.
12/8/97	1125	0	10.4	18.9	20	60	14.4	12.7	8	130	.
11/17/97	1215	0	18.1	24.2	9.2	30	25.1	23.9	4	194	.
10/14/97	1220	0	60.3	34.4	11	50	86.5	12.2	6	244	.
9/8/97	1050	0	53.3	29.7	10	30	46.8	20.3	9	192	.
8/11/97	1830	0	42.8	26.9	18	50	31.5	11.7	3	190	.
7/14/97	1137	0	17.3	17.1	27	50	8	6.5	17	160	.
6/9/97	1155	0	14.2	15.8	29	70	5.4	5.6	23	81.9	.
5/13/97	1155	0	16	17.2	21	30	8.3	6.8	6	116	.
4/14/97	1215	0	12.3	17.5	18	120	14.2	7.2	13	116	.
3/10/97	1140	0	9.9	14.1	17	70	4.3	6.1	9	56	.
2/17/97	1137	0	4.6	7.9	25	100	8.6	5.7	14	108	.
1/6/97	1125	0	12.7	18.2	25	80	14.7	11.4	29	98	.
12/9/96	1110	0	9.4	14.9	16	70	11.7	9.4	11	94	.
11/18/96	1220	0	25.1	23.6	10	60	26.3	11.1	5	126	.
10/15/96	1147	0	28.9	21.4	10	60	29.6	9.5	1	238	.
9/9/96	1220	0	22.4	20.1	10	70	22.1	10.2	5	108	.
8/12/96	1116	0	18	30.4	17	100	16	6.8	32	136	.
7/8/96	1115	0	28.1	28.8	12	70	30.5	9.8	9	136	.
6/10/96	1125	0	45.9	32.7	7.7	100	37.8	7.8	8	186	.
5/13/96	1120	0	36.4	31.5	14	60	40	15.1	4	116	.
4/8/96	1115	0	33	38.2	9.7	60	53	17.2	14	118	.
3/11/96	1135	0	35.6	33.6	8.1	70	25.8	17.1	5	178	.
2/12/96	1057	0	89.5	112	20	60	18.4	17.7	9	164	.
1/9/96	1045	0	18.8	21.8	25	60	18.6	17.6	22	124	.
12/11/95	1120	0	73.2	33.9	4.5	60	77.2	18.5	K 4.0	344	.
11/14/95	1220	0	158	53.5	6.5	80	218	24.4	K 4.0	616	.
10/9/95	1217	1	38.6	28.4	13	30	47.3	15.8	12	162	.
9/11/95	1053	1	53.1	31.1	6.5	60	91.6	9.3	6	334	.
8/14/95	1145	1	16.9	15.6	15	60	16.3	8.9	11	110	.
7/10/95	1135	1	8.9	13.2	21	120	5.3	7.8	54	88	.
6/12/95	1110	0	35.1	34.1	20	40	97.8	7.6	12	271.9	.
5/8/95	1040	1	17.9	19.2	25	40	9.1	7.3	18	122	.
4/4/95	1445	0	23.9	24	26	50	16	8.5	44	104	.
3/14/95	1050	1	6.8	10.5	24	100	4.4	6.5	26	94	.
2/13/95	1135	1	16.9	16.8	19	40	18.2	11.4	18	152	.
1/9/95	1210	1	7.8	14.8	40	60	9.6	8.9	27	110	.
12/12/94	1145	1	17.3	23.6	18	60	18.6	10.2	30	150	.
11/14/94	1140	1	14.3	16.2	14	70	9.1	6.7	13	26	.
10/10/94	955	1	52	26	46	50	48.4	10.8	266	180	.
9/12/94	1115	1	29.7	19.6	20	30	20.2	5.8	6	130	.
8/8/94	1200	1	17.4	22.5	28	50	10.4	7.5	76	14	.
7/11/94	1315	1	68.1	28.8	17	50	33.2	14	5	228	.

APPENDIX A
WATER QUALITY DATA

Castor Creek Near Tullos, Louisiana (continued)
Water Quality Monitoring Network Site 0079
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
6/13/94	1145	1	21.2	22.6	16	30	20.4	7.3	6	126	.
5/9/94	1150	1	6.2	14	55	50	2.7	4.6	76	208	.
4/11/94	1135	1	9.4	27.6	20	60	6.6	6.9	18	94	.
3/14/94	1140	1	4.9	8.3	23	70	2.7	4.8	8	72	.
2/7/94	1110	1	6.7	13.5	18	60	7.9	10.8	6	60	.
1/10/94	1030	1	14.9	24.7	7	60	22.9	16.6	4	110	.
12/13/93	1050	1	11.5	26.2	14	60	26.3	19.1	16	100	.
11/15/93	1055	1	58.1	89.1	29	80	208.6	54.2	31	554	.
10/11/93	1215	0	100	47	8.4	70	188.2	17.6	4	602	.
9/13/93	945	0.5	59.3	33.7	10	120	102	12.6	5	266	.
8/9/93	1120	1	43.8	42.9	13	40	38.2	11.9	18	182	.
7/12/93	1215	1	29.7	34.7	20	50	22.6	10.6	10	204	.
6/14/93	1110	1	46.7	59	19	30	181	10.7	51	436	.
5/10/93	1115	1	12	15	25	50	6	5.6	16	104	.
4/12/93	1140	1	5.6	9.2	21	60	3.2	4.8	12	58	.
3/8/93	1145	1	9	14.9	30	40	8.6	7.8	18	90	.
2/8/93	1143	1	13.6	18.1	24	30	15.7	10.8	18	166	.
1/11/93	1159	1	8.5	16.4	34	60	10.6	9.2	15.5	130	.
12/14/92	1115	1	7.4	14.9	27	40	10.3	9.5	14	100	.
11/16/92	1110	1	10.3	18	17	50	12.5	11.1	10	116	.
10/12/92	1145	1	25.1	23.9	18	30	36.7	8.4	5	180	.
9/14/92	1210	1	20.6	19.6	21	30	13.2	6.3	17	132	.
8/10/92	1230	1	17.1	20.1	19	30	13.7	5.9	25	86	.
7/13/92	1030	1	18.8	21.7	26	30	17.5	6.1	6	122	.
6/15/92	1205	1	10.6	13.5	27	55	4.4	5.3	26	188	.
5/11/92	1055	1	15.8	17.1	25	30	13.6	5.8	10	114	.
4/6/92	1020	1	16.4	20.2	25	30	10.6	6.9	29	.	.
3/9/92	1235	1	5.1	10.1	27	50	2.6	8.3	6	66	.
2/10/92	1135	1	6.3	11.1	32	50	4.7	6.6	13	120	.
1/6/92	1115	1	15.7	18.4	15	40	17.1	9.2	9	124	.
12/9/91	1115	1	5.8	8.1	23	60	4.5	5.8	10	114	.
11/18/91	1045	1	13.9	18.7	17	40	21.4	58.8	10	138	.
10/14/91	1140	1	27.9	26.3	15	30	46.7	7.8	7	228	.
9/9/91	1130	1	13.4	16.3	34	50	7.7	6.5	58	132	.
8/12/91	1105	1	26.4	35.6	119	40	24	16.6	112	210	.
7/15/91	1130	1	19	21.3	26	40	13.9	4.5	12	108	.
6/11/91	1105	1	20.4	21.3	19	50	10.4	4.9	9	128	.
5/13/91	1030	1	10.8	12.4	30	50	3	4.1	12	80	.
4/15/91	1130	1	4	10.2	20	70	3.5	12.1	17	88	.
3/11/91	1040	1	10.7	14.1	22	50	7.2	6.5	10	74	.
2/5/91	955	1	13.7	30.7	30	30	23.5	18.9	31	148	.
1/15/91	1125	1	5	12.1	26	60	3.6	9.6	18	58	.
12/10/90	1130	1	13.5	21.7	18	60	16.9	13.5	15	145	160
11/13/90	1140	1	17	20.2	21	30	19.2	11.9	24	100	124
10/15/90	1225	1	46	40.4	7	20	135	10.4	7	327	334
9/11/90	1225	1	42.2	72.5	12	50	354	9.8	8	724	732
8/14/90	1100	1	20.4	19.4	30	30	28.6	8.4	23	173	196
6/12/90	1040	1	12.7	14.2	18	50	4.7	4.6	18	84	102
4/10/90	1040	1	13.4	20.2	28	40	6.8	8.2	29	99	128
3/13/90	1125	1	14.6	19.3	25	60	11.1	7.4	16	98	114
1/9/90	1025	1	7.4	22.6	25	80	16	17.6	20	94	114
12/12/89	1105	1	29.2	29.5	15	30	79	11.9	14	188	202
11/14/89	1235	1	40.7	35.8	28	40	130.5	8.9	16	386	402
10/10/89	1045	1	42.1	39.2	14	20	152	9.2	14	378	392
9/12/89	1138	1	30.5	31.6	17	50	78.7	7.7	18	168	186
7/11/89	1020	1	13.7	14.9	12	50	4.4	4.9	11	95	106
6/13/89	1206	1	9.3	10.5	23	80	3.2	4.4	14	66	80
5/9/89	1210	1	13	21.4	29	70	6.8	9.2	26	110	136
4/11/89		1	19.5	28.9	24	60	12.1	8	24	118	142
3/14/89	815	1	11.3	15.2	20	40	5.8	7.4	13	105	118
2/14/89	1106	1	12.4	23.8	24	40	13.6	14.3	36	70	106
12/13/88	1120	1	24.5	32.3	28	70	22.6	32.8	44	198	242

APPENDIX A
WATER QUALITY DATA

Castor Creek Near Tullos, Louisiana (continued)
Water Quality Monitoring Network Site 0079
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
11/15/88	1140	1	43.3	35.7	42	80	39	22.7	52	216	268
9/13/88	1215	1	16.7	20.9	13	60	13.9	10.3	360	110	470
8/9/88	1235	1	21.3	21	19	60	23.8	8	16	144	160
6/14/88	1407	1	50.7	40.1	22	80	86.2	7.6	79	285	364
5/10/88		1	31.5	25.8	22	50	33.8	8.6	24	144	168
4/12/88	1130	1	17.6	21.1	50	60	5.5	6.7	40	114	154
3/15/88	1240	1	11.2	14.6	32	60	5.7	6.4	24	112	136
2/9/88	1140	1	13.4	22	40	40	28.1	10.6	96	144	240
1/12/88	1215	1	8.2	15.6	32	40	10.6	10.8	120	70	190
12/15/87	1207	1	15.6	24.3	40	40	28	16.6	132	102	234
10/13/87	1226	1	42.6	29	6.6	60	94.4	9.9	10	196	206
9/15/87	1157	1	33.8	25.3	9	80	48	14.5	6	150	156
8/11/87	816	1	21.3	30.9	29	70	45.9	14.8	26	192	218
7/13/87	1130	1	27	28.8	19	70	29.4	9.5	13	125	138
6/9/87	1330	1	23	25	27	80	27.2	14.2	34	122	156
5/11/87	1139	1	16.9	39.1	88	40	61.8	13	176	164	340
4/13/87	645	1	16.9	21.9	25	100	14.2	37.4	40	106	146
3/9/87	1139	1	10	16.9	27	50	7.3	8.4	16	110	126
2/16/87	1147	1	10.5	21.9	180	50	16.8	12.6	54	118	172
1/12/87	1150	1	9.3	16.6	16	40	9.3	9.6	12	98	110
12/9/86	1136	1	18.9	26.4	22	70	10.1	14.3	8	102	110
11/17/86	1215	1	9	17.3	18	90	7	9.7	18	90	108
10/13/86	1158	1	22.7	47	24	55	48.6	28.6	280	342	622
9/8/86	1208	1	41.5	30.5	10	50	81.7	9.9	2	212	214
8/12/86	1230	1	57.4	79.9	24	40	218	27.6	24	454	478
7/14/86	1125	1	24.9	31.3	40	60	49.9	9.8	10	224	234
6/9/86	1105	1	.	.	64	80	9.9	4.2	46	104	150
5/12/86	1033	1	16.2	19.9	50	60	14.6	93	18	112	130
4/14/86	1108	1	17	27.9	48	50	15.5	11	60	124	184
3/18/86	1034	1	15	22	25	60	16.5	9.5	36	90	126
2/18/86	1103	1	9.8	18	39	40	11.5	12.2	2	124	126
1/13/86	1145	1	17	23	21	30	23	12.2	12	128	140
12/10/85	1120	1	11	17	39	60	10	8	16	104	120
11/19/85	1115	1	17	24	29	60	13.5	9.5	22	120	142
10/15/85	1130	1	18.4	22	20	70	32.5	13.1	6	152	158
9/9/85	1220	1	6.6	12	36	80	4.5	8.5	20	108	128
8/13/85	755	1	31.8	26.4	14	40	17.5	8.1	4	136	140
7/9/85	1030	1	33	27	38	30	43	7.5	27	169	196
5/13/85	1130	1	12	17.6	60	50	22.5	6.3	42	126	168
4/9/85	928	1	13.7	18	38	60	7.5	5.5	20	98	118
3/12/85	1120	1	13.4	19.4	50	50	8	5.7	28	108	136
2/12/85	1205	1	.	.	78	50	8	.	38	128	166
12/11/84	640	1	8	14.2	40	50	8	6.9	24	100	124
11/14/84	1135	1	12.4	20	40	70	10	7.1	22	120	142
10/9/84	1050	1	31.8	36	11	30	80.5	.	6	234	240
9/11/84	1150	1	24	32	28	40	43.8	10.2	16	148	164
8/14/84	950	1	.	.	.	.	.	.	.	.	238
7/9/84	1030	1	14.6	18.6	46	40	12.4	6.6	28	90	118
6/12/84	1055	1	.	.	40	40	5.2	.	38	76	114
5/15/84	1100	1	10.4	18.6	64	50	12	.	44	122	166
4/10/84	1025	1	5.6	12	46	60	5.2	5	20	84	104
3/13/84	1100	1	.	.	40	50	4	.	12	74	86
1/10/84	1030	1	12.4	36.2	62	30	.	22.1	60	190	250

APPENDIX A
WATER QUALITY DATA

Castor Creek Near Tullos, Louisiana (continued)
Water Quality Monitoring Network Site 0079
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
12/12/83	1130	1	.	.	42	60	7.4	.	30	76	106
11/15/83	1100	1	.	.	6.1	40	440	63.7	6	1016	1022
10/11/83	1120	1	44.4	38.4	13	20	126	10.3	12	294	306
9/14/83	1130	1	.	.	16	30	.	.	24	498	522
8/9/83	1102	1	.	.	75	40	140	.	58	356	414
7/12/83	1115	1	22.6	25.4	50	70	24.3	5.7	32	176	208
6/14/83	1040	1	15.4	21	18	70	10.6	.	8	114	122
5/10/83	1030	1	18	25.4	28	50	17.7	5	34	144	178
4/12/83	1240	1	6.4	14	47	50	6	7.3	34	86	120
3/15/83	1150	1	10	22.2	52	50	14.9	.	84	106	190
2/7/83	1310	1	5	11	48	40	4.9	4.4	18	92	110
12/13/82	1130	1	7.4	16	26	80	8.4	.	18	98	116
11/16/82	1150	1	.	.	12	60	23.3	6.5	11	133	144
10/12/82	1035	1	19	17.8	48	40	14.4	7.6	80	96	176
9/14/82	1110	1	32	45.4	79	20	28.5	13.8	68	434	502
8/9/82	1220	1	24.2	25.4	18	70	16.2	3.8	28	146	174
7/13/82	1205	1	20.2	25.2	18	80	18	.	22	168	190
6/15/82	1140	1	.	.	12	40	.	.	20	230	250
5/11/82	1145	1	18.4	23	16	70	19.6	.	30	164	194
4/12/82	1217	1	20	26.8	18	50	22.4	.	34	128	162
2/9/82	1158	1	17	53	51	70	158.4	22.3	58	384	442
12/14/81	1340	1	.	42	6	60	150	12.9	16	328	344
11/16/81	1220	1	.	.	4.5	30	57	.	.	186	186
10/12/81	1240	1	63	144	11	50	1040	22.3	22	1900	1922
9/14/81	1230	1	42	42	19	40	253.5	.	50	500	550
8/11/81	1110	1	116.4	91	7.1	80	359.5	33.9	20	802	822
7/14/81	1300	1	32	0	35	50	52	4.8	42	168	210
6/9/81	1120	1	10.2	10.6	15	100	8	5.1	22	116	138
5/11/81	1232	1	.	22	34	70	42	10.6	72	144	216
4/13/81	730	1	21.2	9.4	17	70	35	7.9	68	140	208
3/10/81	1135	1	9.4	6	19	70	17.3	8.5	18	102	120
2/10/81	1055	1	12	21.2	30	60	49.6	19.5	44	216	260
1/13/81	1145	1	20	23	8	60	42	9.5	6	142	148
12/9/80	0	1	20	.	11	60	50	.	10	174	184
10/14/80	920	1	.	.	10	40	890	.	4	1262	1266
9/15/80	1340	1	53	116.4	7	40	976	.	26	1602	1628
8/11/80	1130	1	.	.	.	50	.	.	.	.	.
6/10/80	1200	1	.	.	.	.	.	.	.	.	.
5/13/80	1015	1	.	.	37	60	40	.	40	126	166
4/15/80	1135	1	.	.	22	40	4.7	.	.	.	.
3/10/80	1320	1	.	.	32	40	22.7	.	.	.	.
2/13/80	1240	1	.	.	14	50	.	.	.	.	.
1/15/80	1110	1	.	.	57	40	21.3	.	.	.	.
12/10/79	945	1	.	2	22	20	.	.	.	.	.
11/5/79	1215	1	.	.	36	60	.	.	.	.	.
10/8/79	1145	1	.	.	23	20	.	.	.	.	.
9/12/79	1130	1	.	.	25	60	.	.	.	.	.
8/14/79	1017	1	.	.	.	.	.	.	.	.	.
7/10/79	1025	1	.	.	38	30	.	.	.	.	.
6/12/79	945	1	.	.	24	80	21	.	.	.	.
5/15/79	1120	1	.	.	.	80	.	.	.	.	.
4/17/79	850	1	.	.	6.7	70	6	.	.	.	.
3/13/79	1315	1	.	.	14	50	12	.	.	.	.
2/13/79	1100	1	.	.	14	30	5.7	.	.	.	.
1/8/79	1330	1	5	13	15	60	17.5	11	30	76	106
12/12/78	1200	1	.	.	.	.	.	.	.	.	.
11/13/78	1000	1	.	.	6	40	1304	.	30	2238	2268
10/9/78	1115	1	76	97	16	30	556	27	10	1022	1032
9/11/78	1015	1	37.6	28	17	60	72.6	8	72	190	262
8/14/78	950	1	50.4	59	14	40	160.7	43.5	40	368	408
7/10/78	1020	1	26.4	31.4	19	50	35.3	.	48	112	160
6/12/78	1050	1	18	.	32	50	22.8	6	46	132	178
5/8/78	1200	1	7.4	17.2	53	70	15	5	122	98	220
4/10/78	1200	1	25	35.2	15	50	67.5	9	14	186	200
3/6/78	1515	1	15	28.2	17	30	46.1	11	.	.	.

APPENDIX A
WATER QUALITY DATA

Beaucoup Creek West of Clarks, Louisiana 081503
Water Quality Monitoring Network Site 0805
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
12/15/99	1250	1	23.7	42.7	4.7	25	5.1	28.1	K 4.0	68	.
11/17/99	1100	1	26.3	32.8	4.1	22	5	15.4	7	61	.
10/20/99	1315	1	36.4	25.4	7.3	32	6.4	12.5	10	95	.
9/22/99	1315	1	35.7	30.4	7.9	43	4.7	7	11	84	.
8/18/99	1305	1	45.3	42	7.7	110	4.5	2.7	8	91	.
7/21/99	1245	1	28.9	27.2	12	100	4.1	4	8	97	.
6/16/99	1540	0	34.9	27.6	16	50	4.5	3	6	97	.
5/19/99	1310	1	26.7	23.8	10	60	4.8	3.7	4	68.1	.
4/21/99	1345	1	13.8	13.3	16	50	3.6	5.1	8	94	.
3/17/99	1220	1	9.9	10	23	60	2.8	6.8	7.5	234	.
2/17/99	1240	1	11.8	13.4	8.1	20	4.4	5.5	14.5	72	.
1/20/99	1310	1	9.1	10.7	9.2	40	4.9	8.5	6	52	.

APPENDIX A
WATER QUALITY DATA

Beaucoup Creek West of Clarks, Louisiana 081503
Water Quality Monitoring Network Site 0334
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
5/11/98	1150	1	13.3	16	13	40	4	5.2	13	14	.
3/9/98	1010	1	5.1	7.2	38	50	2	4.4	16	56	.
1/12/98	1140	1	4.1	6	14	30	4.8	6.3	12	128	.
11/17/97	1125	1	13.2	22.8	6.5	30	7.5	15.8	K 4.0	80.1	.
9/8/97	1110	1	66.9	61.7	13	70	4.3	2.7	6	104	.
7/14/97	1110	1	12.9	14.6	19	60	4	4.9	11.5	53.8	.
5/12/97	1120	1	11.7	12.4	7.5	40	4.5	6.6	9	82.1	.
3/10/97	1120	1	11.1	15.3	6	60	4.7	6.5	5	134	.
1/6/97	1015	1	13.1	14.2	15	50	9.1	7.2	10.7	96.1	.
11/18/96	1200	1	34.7	32.3	3.7	100	8.4	2.8	8	24.1	.
9/9/96	1205	1	28	24.2	10	80	5.9	3.3	14	94	.
7/8/96	1150	1	44.7	35.6	8.2	100	6.6	3.6	12	132	.
5/13/96	1215	1	45.8	41	8.5	20	8.7	3.2	8	54	.
3/11/96	1200	1	18.2	18.6	5.1	60	8.1	5.7	6	40	.
1/8/96	1205	1	9	14.6	15	60	6.8	9.3	120	96	.
11/13/95	1155	1	51.8	45	8.5	60	6.5	2	8	92	.
9/11/95	1212	1	27.8	30.9	10	100	7.2	2.3	14	102	.
7/10/95	1200	1	10.7	14.8	15	50	4.2	7.2	13	98	.
5/8/95	1145	1	15.6	14.6	16	40	3.7	4.2	13	94	.
3/13/95	1135	1	8.9	6.8	11	70	4.5	6	9	108	.
1/9/95	1200	1	7.9	11.1	20	60	6.1	6.2	10	78	.
11/14/94	1140	1	15.4	18.1	7.5	50	5.8	4.4	K 4.0	64	.
9/12/94	1200	1	31.9	28	19	50	5	2.6	14	104	.
7/11/94	1205	1	33	31.2	16	30	5.3	3.5	27	78	.
5/9/94	1130	1	5.1	17.1	25	50	2.2	3.6	13	98	.
3/14/94	1150	1	7.6	10.8	13	70	3.9	5.9	9	52	.
1/10/94	1210	1	10.5	15.9	5.5	70	8.5	9.8	K 4.0	74	.
11/15/93	1150	1	23.2	25.6	24	70	5	5.8	16	74	.
9/13/93	1200	1	45.1	43.5	26	50	5.7	2.5	42	90	.
8/10/93		1	.	.	.	.	.	.	.	.	.
7/12/93	1143	1	26.4	26.9	17	40	5.1	4.2	16	122	.
6/5/93		1	.	.	.	.	.	.	.	.	.
5/10/93	1150	1	13	17	18	30	4.4	5.3	19	88	.
3/8/93	1205	1	11.1	13.8	17	20	4.9	5.9	8.2	100	.
1/11/93	1150	1	9.4	13.7	18	40	6.6	6.2	6	102	.
11/16/92	1125	1	8.4	12.8	12	40	5.2	6.4	7	104	.
9/14/92	951	1	19.8	17.1	16	30	4.4	4.6	9	64	.
7/13/92	1120	1	22.7	25.6	23	30	4.3	3.6	4	78	.
5/11/92	1128	1	13.6	15	19	20	4.2	4.7	6	80	.
3/9/92	1200	1	8.2	9	19	30	3.3	4.7	28	62	.
1/6/92	1148	1	13	13.1	9.5	20	5.6	5.2	4	92	.
11/18/91	1115	1	11.5	14.2	11	30	6.1	6.4	3	58	.
9/9/91	930	1	13.4	18.9	34	60	5.5	5	84	112	.
7/31/91		1	.	.	.	.	.	.	.	.	.
7/15/91	1156	1	23.9	26.3	19	50	3.5	2.9	4	50	.
5/14/91	1235	1	15.7	17	18	50	3.5	4.6	15	108	.
3/11/91	1307	1	13	14.1	67	50	4.1	5.7	8	72	.
1/15/91	1242	1	5.9	7.4	11	50	3.7	6	7	50	.

APPENDIX A
WATER QUALITY DATA

Flat Creek Southeast of Sikes, Louisiana 081504
Water Quality Monitoring Network Site 0806
Source: LDEQ, Office of Environmental Assessment

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
12/15/99	1235	1	52.2	36.3	29	65	9.4	27.4	4.2	137	.
11/17/99	1230	1	49.8	30.2	3.4	30	8.5	13.6	5	66	.
10/20/99	1230	1	26.8	32.6	4.7	30	4.5	12.6	4.5	87	.
9/22/99	1245	1	42.8	31.8	8.3	50	6.9	12.7	7	102	.
8/18/99	1235	1	69.5	60.4	10	110	6.7	2.4	K 4.0	124	.
7/21/99	1210	1	28.4	27.2	11	110	5	3.2	K 4.0	109.9	.
6/16/99	1245	1	13.7	18.2	25	70	4	9.5	16	100	.
5/19/99	1245	1	39.1	35.6	11	80	5.9	2.6	K 4.0	96	.
4/21/99	1305	1	13.2	14.6	21	70	4	6	10	122	.
3/17/99	1300	1	8.4	8.6	22	50	2.7	5.5	4	252	.
2/17/99	1210	1	13	16.7	11	80	6	5.7	13	99.9	.
1/20/99	1235	1	8.8	14.4	17	60	62	10	9.5	76.1	.

APPENDIX B
FLOW DATA

APPENDIX B
ANNUAL PEAK STREAMFLOW DATA

USGS 07370800 Castor Creek at Tullos, LA

Source: USGS

3/28/51	27.2
5/12/52	23.41
5/18/53	33.05
5/1/54	21.17
4/13/55	20.84
2/13/56	20.08
6/22/57	13.09
11/17/57	24.74
4/22/59	25
3/5/60	22.04
2/20/61	25.8
12/13/61	25.58

Average	**23.5**
Harmonic Mean	**22.4**

FLOW DATA
LITTLE RIVER NEAR ROCHELLE, LA

Flow data can be found in the USGS Discharge Database (USGS 07372200 Little River near Rochelle, LA).
http://waterdata.usgs.gov/la/nwis/discharge/?site_no=07372200&agency_cd=USGS

USGS 07372200 LITTLE RIVER NR ROCHELLE, LA
La Salle Parish, Louisiana
Hydrologic Unit Code 08040304
Latitude 31°45'15", Longitude 92°20'40" NAD27
Drainage area 1,899.00 square miles
Gage datum 24.79 feet above sea level NGVD29

$$HM_a = \frac{HM_b}{DA_B} * DA_a$$

Where:

HM_a = harmonic mean flow for Station 0079
DA_a = drainage area above Station 0079 (923.00 square miles)
HM_b = harmonic mean flow of Little River near Rochelle (122.45 cfs)
DA_b = drainage are above Little River near Rochelle (1,899.00 square miles)

HM (at Station 0079) = 59.51 cfs

FLOW DATA
STATION 0332

Flow data can be found in the USGS Discharge Database (USGS 07370500 Castor Creek near Grayson, LA. Station 0332).
http://waterdata.usgs.gov/la/nwis/discharge/?site_no=07370500&agency_cd=USGS

USGS 07370500 CASTOR CK NR GRAYSON, LA (Station 0332)
Caldwell Parish, Louisiana
Hydrologic Unit Code 08040302
Latitude 32°04'55", Longitude 92°12'25" NAD27
Drainage area 271.00 square miles
Gage datum 89.89 feet above sea level NGVD29

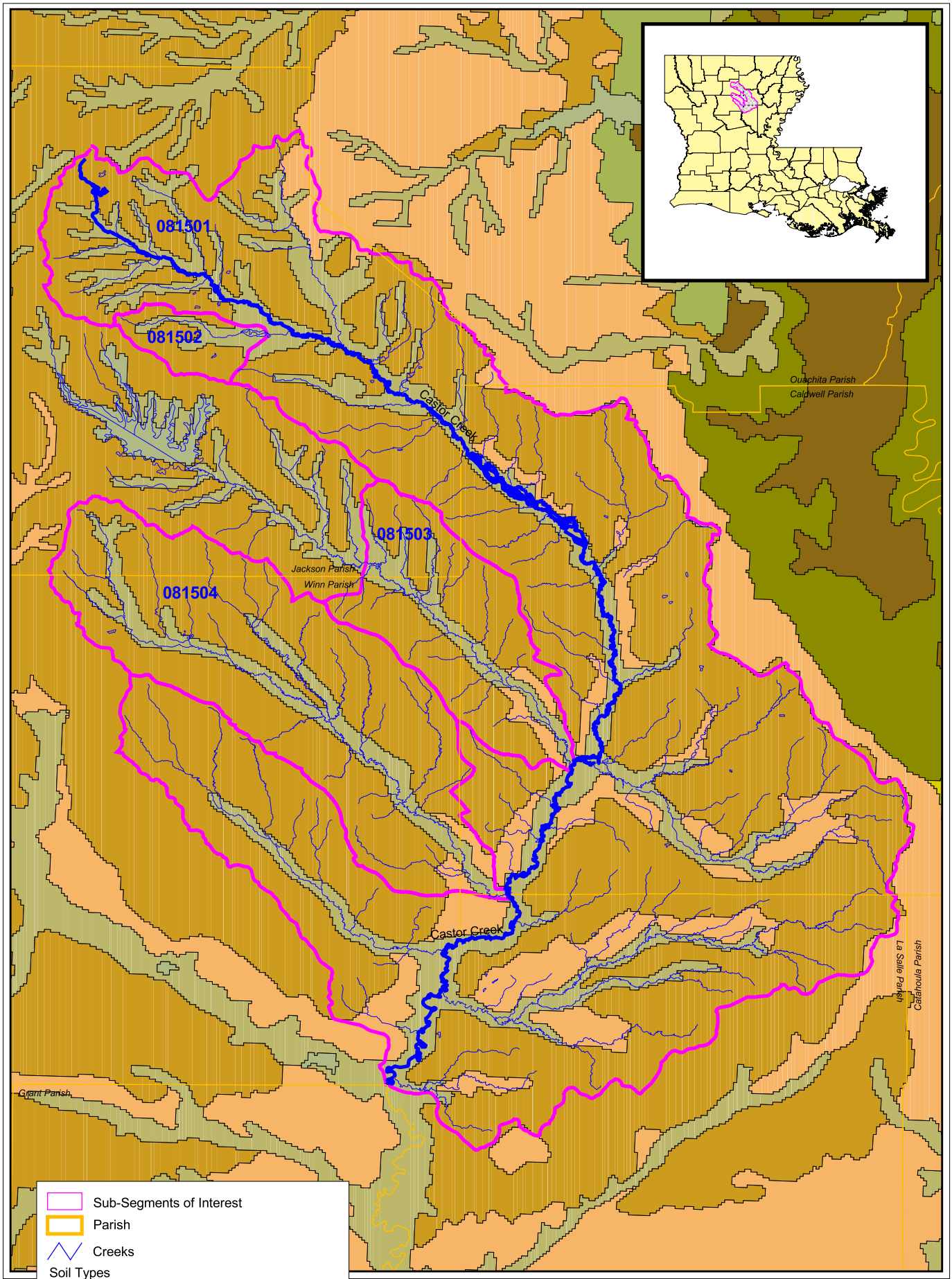
$$HM = \left[\frac{\sum_{i=1}^{N_T - N_0} \frac{1}{Q_i}}{N_T - N_0} \right]^{-1} * \left[\frac{N_T - N_0}{N_T} \right]$$

Where:

HM = harmonic mean flow
Q_i = nonzero flow
N_T = total number of flow values
N_0 = number of zero flow values

HM (at Station 0332) = 0.26 cfs

APPENDIX C
SOILS MAP
(FOR INFORMATIONAL PURPOSES ONLY)



Source: Generalized Soils of Louisiana from NRCS

Figure C.1

Castor Creek Sub-Segment Soils

PARSONS

APPENDIX D
PUBLIC COMMENTS AND EPA RESPONSES

FORMAL PUBLIC COMMENT LETTER SUBMITTED BY LDEQ EMELISE CORMIER, TECHNOLOGY DIVISION (DATE: APRIL 29, 2002)

CHLORIDES, SALINITY/TDS

Castor Creek Chlorides, Salinity/TDS (Subsegment 081501)

1. LDEQ objects to the application of in-stream criteria to the dischargers at "end-of-pipe" without allowing for mixing with upstream flow resulting in unnecessarily stringent wasteload allocations. The Louisiana regulations state: "For chlorides, sulfates and total dissolved solids, criteria are to be met below the point of discharge after complete mixing. Because criteria are developed over a long-term period, harmonic mean flow will be applied for mixing." (33:IX.1115.C.8)

EPA Response

EPA recognizes LDEQ's concern regarding the calculation of the waste load allocations for chlorides and TDS. In the case of chlorides, the WLA has been revised (see pages 5-2 and 5-3) to acknowledge the fact that there is additional assimilative capacity available at station 0079, since at station 0332 the state water quality criterion for chloride is not exceeded. The upstream harmonic mean flow was used, to allow for mixing in a mass balance to solve for the concentration of chloride in the discharge.

For TDS, since the water quality standard for TDS (100 mg/l) is exceeded at Station 0332, mixing with upstream flow quality will not help meet the standard at Station 0079. It is agreed that the Louisiana Regulations allow for mixing in stream and that water quality standards must be met after mixing. In this case, WLA for TDS was calculated using a high discharge TDS concentration of 850 mg/L (Metcalf and Eddy. 1991). See pages 5-2 and 5-3.

2. This TMDL used inappropriate flow data when more appropriate data is available, and faulty calculations of flow from this data resulting in inaccurate TMDL calculations. The USGS station used for the harmonic mean calculation was a peak stage station. This is an inaccurate method for determining a harmonic mean flow in a waterbody, since it is based on peak values and not the entire flow regime. Second the values, which the contractor downloaded from the USGS web site, were not flow rates (cfs), they were gage measurements (feet).

EPA Response

EPA verified LDEQ's assertion regarding the flow data used to calculate the TMDLs and modifications have been made accordingly. Since flows from Station 0079 (USGS 07370800) were not available, the harmonic mean flow at Station 0079 was estimated using the drainage area ratio of that of a nearby gage; USGS 07372200 Little River near Rochelle, LA. The resulting harmonic mean flow at Station 0079 is 59.51 cfs. See page 3-1 and Appendix B respectively, for the revised calculations and data set used.

3. Since EPA erred in calculating the flows and the loads, the resulting TMDL is not conservative and does not have either an implicit or an explicit MOS. LDEQ uses an explicit MOS of 20% for point sources.

EPA Response

EPA recognizes the need to revise the TMDL calculations. In discussion with LDEQ staff to clarify these comments it was agreed that use of an implicit MOS for this TMDL is acceptable to LDEQ. As per these discussions, additional reasons for utilizing an implicit margin of safety will be added to page 5-4.